

**CLAIMS:**

1. A rotary positive displacement machine comprising:
  - a casing having a circular cylindrical internal surface delimiting an operating chamber;
  - a rotor in the operating chamber, the rotor being mounted so as to orbit about a chamber axis which is the axis of the said internal surface, the rotor having a circular cylindrical external surface, the chamber axis passing through the rotor, a generatrix of the external surface being adjacent to the said internal surface, and a diametrically opposite generatrix being spaced from the said internal surface;
  - a vane member mounted on the casing and being pivotable about a pivot axis parallel to the chamber axis, the vane member being accommodated in a fluid inlet/outlet aperture in the casing, the vane member having a passageway communicating between the exterior of the casing and the operating chamber, the vane member having an arcuate face which is coaxial with the said pivot axis and which has a length substantially equal to that of the rotor, the vane member having end faces extending from the respective lateral ends of the arcuate face towards the pivot axis, and the vane member having a tip face adjacent the rotor, the said faces being sealing faces with respect to corresponding surfaces of the casing aperture and the rotor; and
  - a linkage which connects the vane member to the rotor so as to keep the tip face of the vane member in sealing contact with the external surface of the rotor, the linkage being connected to the vane member by an articulation having an articulation axis such that a plane containing the articulation axis and the axis of the said external surface passes through the region of sealing contact.
2. A machine as claimed in claim 1, including a pair of discs at respective ends of the rotors, the discs rotating about the chamber axis in synchronism with the orbiting of the rotor and delimiting respective ends of the operating chamber.
3. A machine as claimed in claim 2, wherein at least one of the discs constitutes a shutter covering at least one inlet/outlet port in the casing, the shutter having at least one passage with a first end which is in the operating chamber and a second end which is

outside the operating chamber and which periodically overlaps the said inlet/outlet port as the shutter rotates.

4. A machine as claimed in claim 3, in which the second end of the passage is in the periphery of the shutter.
5. A machine as claimed in claim 4, in which the passage is in the form of a slot open at the inner face and the periphery of the shutter.
6. A machine as claimed in any of claims 3 to 5, in which there are a plurality of said passages arranged successively in the circumferential direction.
7. A machine as claimed in any of claims 3 to 6, in which there are a plurality of said inlet/outlet ports arranged successively in the circumferential direction.
8. A machine as claimed in any of claims 1 to 6, in which the casing has a plurality of fluid inlet/outlet ports.
9. A machine as claimed in claim 8, including means for selectively closing the fluid inlet/outlet ports.
10. A machine as claimed in claim 9, in which the closing means comprises a slider.
11. A machine as claimed in claim 10, in which the slider is in the form of a ring extending around the casing.
12. A machine as claimed in any preceding claim, in which the said aperture in the casing extend from the surface corresponding to the arcuate surface of the vane member, taken as 0°, over an angular range of up to 70°, e.g. 40°.
13. A machine as claimed in claim 12, functioning as a compressor, in which the fluid enters through the passageway in the vane member, and the casing has at least one evacuation orifice within an angular range of 140° from the end of the said aperture.

14. A machine as claimed in claim 12 or 13, in which the casing has at least one exit orifice within the angular range from 240° to 360°.
15. A machine as claimed in any preceding claim, in which the casing has at least one exit orifice provided with a reed valve.
16. A machine as claimed in any preceding claim, in which the external surface of the rotor has axial grooves providing a labyrinth-type seal between the rotor and the casing.
17. A machine as claimed in claim 16, in which the groove depth is substantially the same as the groove width.
18. A machine as claimed in claim 16 or 17, in which adjacent grooves define between them a fin having a width less than the groove width.
19. A machine as claimed in any preceding claim, in which the rotor comprises a rotating inner part and a non-rotating outer part.
20. A machine as claimed in claim 19, in which the inner end of the vane member is received in a recess in the external surface of the outer part of the rotor.
21. A machine as claimed in claim 19 or 20, in which the external surface of the outer part of the rotor has a coating of a compliant material, e.g. rubber.
22. A machine as claimed in claim 21, in which the coating has axially extending grooves.
23. A machine as claimed in claim 22, in which end groove has one steep sidewall and one gradually sloping sidewall.

24. A machine as claimed in any preceding claim, in which the linkage comprises a connecting link having one end articulated to an extension of the rotor on an axis coincident with the axis of the said external surface, and the other end articulated on the said articulation axis to a lever arm which is rigid with the vane member and which is pivotable about the said pivot axis.
25. A machine as claimed in claim 24, in which the linkage further comprises balance links connected between the said rotor extension and the pivot axis.
26. An engine system comprising an internal combustion engine having an inlet manifold, and at least one machine according to any of claims 1 to 25 connected to the inlet manifold.
27. An engine system as claimed in claim 26, in which at least two said machines are connected to the inlet manifold.
28. An engine system as claimed in claim 27, in which at least one of the said machines is connected to the inlet manifold by a valve for selectively directing the airflow from the said one machine to the inlet manifold or to the atmosphere.
29. An engine system as claimed in claim 27, in which a pair of the said machines is arranged in such a manner that out of balance forces oppose one another.
30. An engine system as claimed in any of claims 26 to 29, in which at least one said machine is connected to an energy-using device and the rotor of the said machine is drivable by the pressure difference between ambient air and air at the inlet manifold.
31. An engine system as claimed in any of claims 26 to 30, further comprising an exhaust turbine, preferably driving a compressor and/or a generator.
32. An engine system as claimed in claim 31, in which the exhaust turbine is constituted by a machine according to any of claims 1 to 25 except claims 13 and 14.

33. A heat pump including a compressor and an expander, at least one of which is constituted by a machine according to any of claims 1 to 25.

34. A combined compressor and expander, comprising respective machines according to any of claims 1 to 25, the casings of the two machines being fixed end-to-end and having a common axis, and the rotor of the two machines being operatively connected to orbit in synchronism.

35. A combined compressor and expander as claimed in claim 34, in which the orbits of the rotor of the two machines are offset in opposite directions with respect to the common axis.